

1

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Notic of Allowability</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/602,137             | MA ET AL.           |  |
|                              | <b>Examin r</b>        | <b>Art Unit</b>     |  |
|                              | Pamela E Perkins       | 2822                |  |

**-- The MAILING DATE of this communication appears on the cover sh et with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed on 21 May 2004.
2. ☒ The allowed claim(s) is/are 19-22,24,27 and 36-41.
3. ☒ The drawings filed on 23 June 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachm nt(s)**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br/>Pap r No./Mail Date _____</li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br/>of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____</li> </ol> |
|---|---|

  
**AMIR ZARABIAN**  
**SUPERVISORY PATENT EXAMINER**  
**TECHNOLOGY CENTER 2800**

### DETAILED ACTION

This office action is in response to the filing of the amendment on 21 May 2004. Claims 19-22, 24, 27 and 36-41 are pending; claims 1-18, 23, 25,26 and 28-35 have been canceled.

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

The application has been amended as follows:

Claim 19 has been amended as follows:

19. A process of fabricating a microelectronic package, comprising:
- providing a die affixed to a carrier substrate, the substrate having formed therein a through-hole extending from a first exterior surface to a second exterior surface of the substrate, the through-hole configured to allow the flow of an underfill encapsulation material into a gap between the die, the substrate, and the a heat spreader;
  - coupling a the heat spreader to the backside of the die using heat conductive adhesive, the heat spreader including a plurality of pillars surrounding the die to shift thermally induced stress away from the comers and edges of the die to the pillars of the heat spreader; and

dispensing of an underfill encapsulation material through the through-hole such that the underfill encapsulation material flows into a gap between the die, the heat spreader, and the substrate.

***Allowable Subject Matter***

Claims 19-22, 24, 27 and 36-41 are allowed.

***Reasons for Allowance***

The following is an examiner's statement of reasons for allowance: prior art does not anticipate, teach, or suggest a process of fabricating a microelectronic package where a die is affixed to a carrier substrate, the substrate having formed therein a through-hole extending from a first exterior surface to a second exterior surface of the substrate, the through-hole configured to allow the flow of an underfill encapsulation material into a gap between the die, the substrate, and the heat spreader; coupling a heat spreader to the backside of the die using heat conductive adhesive, the heat spreader including a plurality of pillars surrounding the die to shift thermally induced stress away from the corners and edges of the die to the pillars of the heat spreader; and dispensing of an underfill encapsulation material through the through-hole such that the underfill encapsulation material flows into a gap between the die, the heat spreader, and the substrate.

For example, Mertol et al. (6,114,761) disclose a process of fabricating a microelectronic package where a heat spreader is coupled, using a heat conductive

adhesive, to the backside of a die, wherein the heat spreader including a plurality of pillars that shift thermally induced stress away from the corners and edges of the die. Mertol et al. further disclose attaching mechanical reinforcements between a substrate and the heat spreader. Mertol et al. also disclose the die affixed to the substrate with a plurality of solder balls disposed on an active surface of the die aligned with a plurality of bond pads disposed on an active surface of the substrate. However, Mertol et al. do not disclose, anticipate, teach, or suggest the substrate having formed therein a through-hole extending from a first exterior surface to a second exterior surface of the substrate, the through-hole configured to allow the flow of an underfill encapsulation material into a gap between the die, the substrate, and the heat spreader; and dispensing of an underfill encapsulation material through the through-hole such that the underfill encapsulation material flows into a gap between the die, the heat spreader, and the substrate.

Weber (6,157,086) discloses a process of fabricating a microelectronic package where a through-hole extending from one exterior surface of a substrate to another exterior surface of the substrate, wherein the through-hole is configured to allow for passage of underfill material to flow around solder bumps of a chip which are used to connect the chip to the substrate. Weber further discloses using the through-hole as a vent hole such that air can escape during an underfill of a flip-chip bonding to the substrate. However, Weber does not disclose, anticipate, teach or suggest the through-hole configured to allow the flow of an underfill encapsulation material into a gap between the die, the substrate, and the heat spreader.

The prior art made of record in this action does not anticipate, teach, or suggest a process of fabricating a microelectronic package where a die is affixed to a carrier substrate, the substrate having formed therein a through-hole extending from a first exterior surface to a second exterior surface of the substrate, the through-hole configured to allow the flow of an underfill encapsulation material into a gap between the die, the substrate, and the heat spreader; coupling a heat spreader to the backside of the die using heat conductive adhesive, the heat spreader including a plurality of pillars surrounding the die to shift thermally induced stress away from the corners and edges of the die to the pillars of the heat spreader; and dispensing of an underfill encapsulation material through the through-hole such that the underfill encapsulation material flows into a gap between the die, the heat spreader, and the substrate.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Pamela E Perkins whose telephone number is (571) 272-1840. The examiner can normally be reached on Monday thru Friday, 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

PEP

  
AMIR ZARABIAN  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800